Int. J. Heat Mass Transfer. Vol. 5, p. 425. Pergamon Press 1962. Printed in Great Britain.

BOOK REVIEW

Combustion, Flames and Explosion of Gases (2nd Ed.). B. LEWIS and G. VON ELBE. Academic Press, New York, 1961. 731 pp. 157*s* 6*d*.

THE first edition of the present work appeared in 1951, at which time the combustion scene was still dominated by physical chemists. In the succeeding decade, mathematicians, aerodynamicists and engineers have joined the chemists; their combined efforts have resulted in the elucidation of many previously obscure questions so that few mysteries now remain. For example, the theory of the laminar combustion wave has been developed to the point at which only the paucity of reaction–kinetic data prevents the precise computation of flame speeds; and many gas-phase combustion processes in complex aerodynamic flows have been reduced to order by the techniques of dimensional analysis. Comprehensive theories have also been constructed for the combustion of solid and liquid fuels, largely as a result of the problems thrown up by the development of gas-turbine, ramjet and rocket engines.

Unfortunately, the authors have not found it possible to accommodate more than a fraction of this new material in their second edition, which is remarkably like the first. It is true that they have completely and generously retracted the section dealing with the "excess enthalpy" of the laminar combustion wave, which has proved not to have the importance (or perhaps even the existence) which they formerly ascribed to it. But it is disappointing not to find even the most elementary treatment of the mathematical theory of the laminar flame; the dimensionless correlation of flame-extinction phenomena is also omitted. Engineers concerned with air-breathing jet engines will be surprised to find no mention of the fruitful work of Longwell and others on the determination of gas-phase combustion rates in the "well-stirred reactor".

Perhaps because of the restriction implied by the title, the authors do not give any substantial account of the combustion of a solid or liquid fuel suspended in a gas stream; the territory of the book therefore only overlaps with the territory of the present journal in a few places. Where it does so, errors may be found. Thus on page 446 it is stated that the heat transfer coefficient on the surface of a cylinder held at right angles to a fluid stream has its greatest value at the edges of the diametral plane which is normal to the mainstream direction; actually the heat transfer coefficient usually has its minimum value there, as is indeed evident from the diagrams in the book which clearly show the thickening of the boundary layer at these points.

This reviewer takes no pleasure in reporting on a book in entirely unfavourable terms. Unfortunately all the complimentary remarks were used up at the time of the appearance of the first edition. The kindest thing that can be said is that the new volume again presents a good review of the state of knowledge of combustion prevalent in 1951. We can at least all take comfort from the fact that even Lewis and von Elbe, like lesser men, find difficulty in keeping up with the literature.

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